OCCUPATIONAL ANALYSES SERIES

Construction Electrician

2003

Human Resources Development Canada
Développement des ressources humaines Canada

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Occupational Analyses Series

Construction Electrician

2003

Policy and Apprenticeship Division
Human Resources
Partnerships Directorate

Division des politiques et de
l'apprentissage
Direction des partenariats
en ressources humaines

Disponible en français sous le titre : Électricien/électricienne (construction)

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Occupational Analysis as the national standard for the occupation of Construction Electrician.

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OTHER RELATED OCCUPATIONAL TITLES

This analysis covers tasks performed by a construction electrician whose occupational title has been identified by some provinces and territories of Canada under the following names:

- Electrical Construction
- Electrician
- Electrician (Construction)
- Electrician – Construction and Maintenance

LIST OF PUBLISHED OCCUPATIONAL ANALYSES *

TITLE	NOC** Code
Appliance Service Technician (1997)	7332
Aquaculture Technician (1977)	2221
Arts Administrator (1989)	0114
Automotive Painter (1995)	7322
Automotive Service Technician (1998)	7321
Automotive Technician - Automatic Transmission (1990)	7321
Automotive Technician - Electrical/Electronics (1992)	7321
Automotive Technician - Engine Repair and Fuel Systems (1989)	7321
Automotive Technician - Front-End (1989)	7321
Automotive Technician - Manual Transmission, Driveline and Brakes (1990)	7321
Aviation Machinist (1994)	7231
Baker (1997)	6252
Blaster (Surface) (1987)	7372
Boilermaker (2003)	7262
Bricklayer (2000)	7281
Cabinetmaker (2000)	7272
Carpenter (1998)	7271
Cement Finisher (1995)	7282
Construction Electrician (2003)	7241
Cook (1997)	6242
Electrical Rewind Mechanic (1999)	7333
Electronics Technician (Consumer Products) (1997)	2242
Electronics Technician Vol. I (1986) (Video Equipment)	2242
Electronics Technician Vol. II (1986) (Audio Equipment)	2242

* **Red Seal analyses are indicated in bold**

** **National Occupational Classification**

Electronics Technician Vol. III (1986) (Computer Equipment)	2242
Electronics Technician Vol. IV (1986) (Office Equipment)	2242
Electronics Technician Vol. VI (1986) (Communication Equipment)	2242
Electronics Technician Vol. VII (1986) (Signaling Equipment)	2242
Electronics Technician Vol. VIII (1986) (Navigation Equipment)	2242
Electronics Technician Vol. IX (1986) (Video Game Equipment)	2242
Electronics Technician Vol. X (1987) (CADD Equipment)	2242
Electronics Technician Vol. XI (1987) (CAM Equipment)	2242
Electronics Technician Vol. XII (1987) (Robotics Equipment)	2242
Electronics Technician Vol. XIII (1987) (Biomedical and Laboratory Equipment)	2242
Electronics Technician Vol. XIV (1987) (Industrial Process-Control Equipment)	2243
Farm Equipment Mechanic (2000)	7312
Floorcovering Installer (1997)	7295
Glazier (1994)	7292
Hairstylist (1997)	6271
Heating (Gas and Oil) Servicer - Commercial and Industrial (1978)	7331
Heavy Duty Equipment Mechanic (1998)	7312
Heavy Equipment Operator (1983)	7421
Industrial Electrician (1997)	7242
Industrial Instrument Mechanic (2000)	2243
Industrial Mechanic (Millwright) (1999)	7311
Insulator (Heat and Frost) (2000)	7293
Ironworker (Generalist) (1993)	7264
Lather (Interior Systems Mechanic) (2002)	7284

Logistics (1992)	0713
Machinist (1998)	7231
Major Electrical Appliance Repairer (1984)	7332
Mobile Crane Operator (1997)	7371
Motorcycle Mechanic (1995)	7334
Motor Vehicle Body Repairer (Metal and Paint) (1997)	7322
New Home Builder and Residential Renovation Contractor (1992)	0712
Oil Burner Mechanic (1997)	7331
Painter and Decorator (2000)	7294
Partsperson (1995)	1472
Plumber (1996)	7251
Power Engineer (1997)	7351
Powerline Technician (1996)	7244
Recreation Vehicle Service Technician (2000)	7383
Refrigeration and Air Conditioning Mechanic (1997)	7313
Roofer (1997)	7291
Sheet Metal Worker (1997)	7261
Sprinkler System Installer (2003)	7252
Steamfitter-Pipefitter (1996)	7252
Steel Fabricator (Fitter) (1994)	7263
Tool and Die Maker (1997)	7232
Truck-Trailer Repairer (1994)	7321
Truck and Transport Mechanic (2000)	7321
Welder (1996)	7265

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FOREWORD

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to co-operate with provincial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources Development Canada sponsors a program, under the guidance of the Canadian Council of Directors of Apprenticeship (CCDA), to develop a series of occupational analyses.

The Occupational Analysis Program has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations;

- to identify those tasks that are performed by skilled workers in every province and territory;

- to develop instruments for use in the preparation of interprovincial standards "Red Seal" examinations and curricula for training leading to the certification of skilled workers;

- to facilitate the mobility, in Canada, of trainees and skilled workers;

- to supply employers and employees, and their associations, industries, training institutions and governments with analyses of the tasks performed in particular occupations.

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GUIDE TO ANALYSIS

DEVELOPMENT OF ANALYSIS

A draft analysis is developed by a knowledgeable consultant who, with the assistance of a committee of industry experts in the field, identifies all the tasks performed in the occupation.

The draft is then assigned to occupational analysts at Human Resources Development Canada for translation and then returned to the consultant for review to ensure conformity with the nationally approved format.

The consultant will then forward a copy of this analysis to provincial/territorial authorities for validation by specialists in the field. Their recommendations are assessed and incorporated into the final draft which also includes the identification of the common core tasks performed in the occupation.

The occupational analysis is published in both official languages.

STRUCTURE OF ANALYSIS

To facilitate understanding of the nature of the occupation, the work performed is divided into the following divisions:

A. **BLOCK** – is the largest division within the analysis and reflects a distinct operation relevant to the occupation.

B. **TASK** – is the distinct activity that, combined with others, makes up the logical and necessary steps the worker is required to perform to complete a specific assignment within a "BLOCK".

C. **SUB-TASK** – is the smallest division into which it is practical to subdivide any work activity and, combined with others, fully describes all duties constituting a "TASK".

Supporting Knowledge & Abilities

The elements of skill and knowledge that an individual must acquire to adequately perform the task are identified under this heading.

Trends

Any shifts or changes in technology that affect the block are identified under this heading.

Related Components

All components of a specified task being undertaken by the construction electrician are identified under this heading.

Tools and Equipment

All tools and equipment necessary for the construction electrician to complete a task are identified under this heading.

VALIDATION METHOD

At the request of the Canadian Council of Directors of Apprenticeship (CCDA), the Standardization Sub-committee developed a method for validating the Red Seal national occupational analyses.

A draft of the analysis is sent to all provinces/territories for validation. Each jurisdiction rates the sub-tasks and applies percentage ratings to blocks and tasks. This method for the validation of the national occupational analysis identifies common core tasks across Canada for a specific occupation. This feature facilitates the weighting of the Interprovincial Red Seal examinations.

DEFINITIONS

YES: the sub-task is performed by workers in the occupation in a specific jurisdiction.

NO: the sub-task is not performed by workers in the occupation in a specific jurisdiction.

BLOCK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each block of the analysis.

TASK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, that will be placed on an interprovincial examination to assess each task of the analysis.

NV: Not Validated by a province/territory.

ND: Not Designated in a province/territory.

PROVINCIAL/TERRITORIAL ABBREVIATIONS

NL:	Newfoundland and Labrador
NS:	Nova Scotia
PE:	Prince Edward Island
NB:	New Brunswick
QC:	Quebec
ON:	Ontario
MB:	Manitoba
SK:	Saskatchewan
AB:	Alberta
BC:	British Columbia
NT:	Northwest Territories
YK:	Yukon
NU:	Nunavut

COMMON CORE

The criteria for determining common core depend on the performance of sub-tasks. If 70% of the responding jurisdictions (excluding NVs and NDs) perform a sub-task, it shall be considered common core.

Interprovincial Red Seal examinations are based on the common core identified through this validation process. This process identifies what will be assessed through the interprovincial examination.

BLOCKS AND TASKS WEIGHTING (APPENDIX "C")

This appendix represents the block and task percentages as submitted by each jurisdiction.

Each jurisdiction, with the use of a provincial/territorial occupational advisory committee, validates the content, places percentages on blocks and tasks, and indicates whether or not the sub-tasks are performed by the skilled workers within the occupation. The results of this exercise are submitted to the consultant who then analyzes the data and develops this appendix which provides the individual jurisdictional validation results as well as the national averages of all responses.

PIE CHART (APPENDIX "D")

The graph depicts the national percentages assigned to blocks in the analysis.

SCOPE OF THE CONSTRUCTION ELECTRICIAN OCCUPATION

The title "construction electrician" defines a person who, because of his or her knowledge, training and abilities, is capable of laying out, installing, testing, troubleshooting, and repairing electrical systems, which provides light, heat, communications, and power to a variety of new and existing residential, commercial, and industrial structures.

Construction electricians read and interpret electrical, mechanical, and architectural drawings and electrical code specifications to determine wiring layout. They cut, thread, bend, assemble, and install conduits and other types of electrical conductor enclosures and fittings. They pull wire and cable through conduits, position, maintain and install distribution and control equipment such as switches, relays, circuit breaker panels, and fuse enclosures, install single and multi-wire cables above and underground, install data cabling, and install and maintain fibre optic and signalling systems.

Construction electricians work in the full range of environmental conditions: from outside in all weathers; inside in dusty industrial plants and mills; to state-of-the-art clean-rooms in hospitals and manufacturing plants. The work often requires considerable standing, bending, crawling, lifting, climbing, pulling, and reaching and may be conducted in cramped, confined spaces or on ladders and scaffolding at great heights. Hazards include electric shocks, burns, and falling objects.

Construction electricians are required to have good mechanical ability, a thorough knowledge of the principles of electricity, circuitry, and power distribution systems, and familiarity with the materials and techniques of construction. All construction electricians are required to be competent in the use of hand and power tools and test equipment.

All electrical wiring and installations must conform to the CSA Canadian Electrical Code. Therefore construction electricians must be thoroughly familiar with the latest issue of this document. For safety, permits and other regulations they follow local electrical, building and safety codes.

On small jobs, construction electricians may work alone with minimal supervision, and they may supervise an apprentice. On large jobs, they may work under the direction of a supervisor.

Construction electricians interact and work co-operatively with the full spectrum of construction tradespeople, such as carpenters, lathers, cabinetmakers, plumbers, and heating, ventilation and air-conditioning technicians. They are required to constantly adjust their schedule and work to accommodate the schedule of these other trades since most trades rely on some sort of electrical connections at specific points in the construction cycle.

With advances in technology the work of the construction electrician is changing. Today's wired environment requires construction electricians to be able to install a variety of wiring such as data, audio, video, signalling, and communication cabling. Electrical control systems are also becoming more complex, often solid-state or computer-controlled, which requires the construction electrician to have a greater knowledge of electronic systems.

OCCUPATIONAL OBSERVATIONS

The construction industry, like many other sectors of the economy, is experiencing new directions and rapid changes, due to technological innovations that prevail today.

Basic computer skills are becoming a necessary occupational skill. With computerized plan design, paperless plans, and other computer applications, development of computer skills is essential.

Like many construction occupations, the construction electrician occupation is suffering from an ageing workforce. Many practitioners are approaching retirement age, and the trade is attracting fewer new entrants to replace them.

Deregulation of the electrical and telephone industry has had a profound effect on construction electricians: they are now expected to provide additional wiring to suit a variety of service providers and may find themselves competing with untrained and unlicensed people who provide wiring services.

SAFETY

Safe working procedures and conditions, accident prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment.

It is imperative to apply and be familiar with the Occupational Health and Safety Act and Regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment.

As safety education is an integral part of training in all jurisdictions, personal safety practices are not recorded in this document. However, the technical safety aspects relating to each task and sub-task are included throughout this analysis.

ANALYSIS

BLOCK A

OCCUPATIONAL SKILLS

Trends: *Increasing use of computers and electronic communication devices for documentation, distribution of codes/drawings, time management, and the scheduling of time lines as well as on-site communication. An increase in the use of computerized tools allowing for greater portability.*

Task 1 Interprets occupational documentation.

Related Components: Structural, architectural, and mechanical drawings, power distribution drawings, wiring diagrams, electrical and electronic schematics, process and instrumentation drawings, layout drawings, estimates, service manuals, operating manuals, safety manuals, technical bulletins, standard operating procedures, cost regulations, federal and provincial, electrical and building codes, amendments, ECUSR, IEEE, CSA, ULC, ISA standards, WHMIS manual, OHSA.

Tools and Equipment: Computer, CAD software, rulers, printers, scanners, plotters, DVD/CD player, VCR player, cameras.

Sub-task

1.01 Interprets drawings and specifications.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

1.01.01 knowledge of drawing sections and types such as architectural, mechanical, and electrical

1.01.02 knowledge of specification divisions and precedence

1.01.03 knowledge of symbols and legends in the various types of drawings and specifications

1.01.04 knowledge of specification addenda and change orders

1.01.05 ability to analyze drawings

Supporting Knowledge & Abilities

1.01.06 ability to find related information in specifications, addenda and change orders

1.01.07 ability to conceptualise finished project

Sub-task

1.02 Interprets codes and regulations.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

1.02.01 knowledge of government standards and regulations such as the Occupational Health and Safety Act (OHSA), and the Workplace Hazardous Material Information System (WHMIS)

1.02.02 knowledge of federal, provincial and municipal building codes

1.02.03 knowledge of the Canadian Electrical Code

1.02.04 knowledge of quality assurance standards such as Underwriters Laboratories of Canada (ULC) handbook and Canadian Standards Association (CSA) codes

1.02.05 ability to keep codes and regulations up to date

1.02.06 ability to apply codes and regulations

Sub-task

1.03 Interprets material and equipment documentation.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

1.03.01 knowledge of hazardous material specifications (WHMIS)

Supporting Knowledge & Abilities

1.03.02	knowledge of manufacturers' documents and specifications
1.03.03	knowledge of record keeping, filing, and retrieval methods
1.03.04	ability to keep detailed records
1.03.05	ability to file and retrieve information
1.03.06	ability to follow manufacturers' instructions
1.03.07	ability to interpret Material Safety Data Sheets (MSDS)

Sub-task

1.04 Maintains work-related records.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

1.04.01	knowledge of hazardous material specifications (WHMIS)
1.04.02	knowledge of record-keeping requirements
1.04.03	ability to maintain work logs and ledgers
1.04.04	ability to keep time and material records
1.04.05	ability to interpret Material Safety Data Sheets (MSDS)
1.04.06	ability to keep material and service documentation updated

Task 2 Organizes work.

Related Components: Materials list, dust barriers, temporary railings, hoarding, copy of safety regulations, filing system(s), personal organiser, communication system, schedule.

Tools and Equipment: Gang boxes, lunch table, blueprint table, broom, shovel, garbage bins, hazardous waste containers, lock-outs and tags.

Sub-task

2.01 Prepares work site.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

2.01.01	knowledge of light demolition techniques and waste removal
2.01.02	knowledge of how work impacts on surrounding areas
2.01.03	knowledge of dust barriers, hoarding and guard-rail requirements
2.01.04	knowledge of safety codes applicable to work site
2.01.05	ability to assess site readiness
2.01.06	ability to pre-clean work site
2.01.07	ability to apply all safety codes applicable to work site
2.01.08	ability to install dust barriers, hoarding and guard rails
2.01.09	ability to remove obstructions

Sub-task

2.02 Performs lock-out and tagging procedures.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

2.02.01	knowledge of lock-out and tagging procedures and techniques
2.02.02	knowledge of lock-out and tag removal procedures
2.02.03	knowledge of plant requirements
2.02.04	ability to implement lock-out procedures
2.02.05	ability to affix tags and signage
2.02.06	ability to follow lock-out and tagging procedures
2.02.07	ability to follow lock-out and tag removal procedures

Sub-task

2.03 Estimates materials and supplies required for job.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

2.03.01	knowledge of required materials and supplies
2.03.02	knowledge of inventory control
2.03.03	ability to source material
2.03.04	ability to estimate materials and supplies needed as job progresses

Sub-task

2.04 Organizes materials and supplies.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

2.04.01	knowledge of proper storage of materials and supplies on site to ensure security and ease of use
2.04.02	knowledge of the sequence in which materials are to be used
2.04.03	knowledge of methods for securing and protecting materials
2.04.04	ability to place materials on site
2.04.05	ability to protect and secure materials
2.04.06	ability to return unused material

Sub-task

2.05 Develops and maintains schedule.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

2.05.01	knowledge of sequence of work
2.05.02	knowledge of the requirements of other trades on site
2.05.03	knowledge of communication techniques
2.05.04	ability to estimate time to complete specific tasks
2.05.05	ability to co-ordinate work with others
2.05.06	ability to communicate and cooperate with others

Task 3 Communicates in the workplace.

Related Components: None.

Tools and Equipment: Communication devices (fax, cellular phone, telephone, photocopier, computer, radio).

Sub-task

3.01 Communicates with other disciplines, co-workers, and clients.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

3.01.01	knowledge of job-related terminology
3.01.02	knowledge of report formats
3.01.03	ability to actively listen
3.01.04	ability to translate technical terms into layperson language
3.01.05	ability to address other's concern's
3.01.06	ability to write reports in the prescribed format

Sub-task

3.02 Communicates with apprentices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

3.02.01	knowledge of capability of apprentice
3.02.02	ability to teach, coach or mentor others
3.02.03	ability to listen to and assist with problems
3.02.04	ability to supervise
3.02.05	ability to assess and record ongoing progress

Task 4 Uses and maintains tools and equipment.

Related Components: None.

Tools and Equipment: See Appendix "A".

Sub-task

4.01 Uses hand tools. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.01.01	knowledge of types and uses of hand tools
4.01.02	knowledge of hand tool safety
4.01.03	ability to select and use hand tools required for task
4.01.04	ability to identify damaged, worn, or otherwise unsafe hand tools
4.01.05	ability to store hand tools

Sub-task

4.02 Uses power tools. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.02.01	knowledge of types and uses of air, electric and hydraulic power tools
4.02.02	knowledge of power tools components
4.02.03	knowledge of operating procedures for power tools
4.02.04	knowledge of power tool safety
4.02.05	knowledge of manufacturers' recommended uses and limitations
4.02.06	ability to select power tools required for task

Supporting Knowledge & Abilities

4.02.07	ability to identify damaged, worn, or otherwise unsafe power tools
4.02.08	ability to store power tools

Sub-task

4.03 Uses powder-actuated tools. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.03.01	knowledge of types and uses of powder-actuated tools
4.03.02	knowledge of powder-actuated tools components
4.03.03	knowledge of operating procedures for powder-actuated tools
4.03.04	knowledge of powder-actuated tool safety
4.03.05	knowledge of manufacturers' recommended uses and limitations
4.03.06	knowledge of licensing or training requirements prior to use of powder-actuated tools
4.03.07	ability to select powder-actuated tools required for task
4.03.08	ability to identify damaged, worn, or otherwise unsafe powder-actuated tools
4.03.09	ability to charge powder-actuated tools
4.03.10	ability to store powder-actuated tools

Sub-task

4.04 Uses electrical measuring equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.04.01	knowledge of types and uses of electrical measuring equipment
4.04.02	knowledge of electrical measuring equipment components
4.04.03	knowledge of operating procedures for electrical measuring equipment
4.04.04	knowledge of electrical measuring equipment safety
4.04.05	knowledge of manufacturers' recommended uses and limitations
4.04.06	ability to select electrical measuring equipment required for task
4.04.07	ability to identify damaged, worn, or otherwise unsafe electrical measuring equipment
4.04.08	ability to connect electrical measuring equipment
4.04.09	ability to interpret equipment readings
4.04.10	ability to store electrical measuring equipment

Sub-task

4.05 Uses scaffolding and access equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.05.01	knowledge of types and uses of scaffolding and access equipment

Supporting Knowledge & Abilities

4.05.02	knowledge of components of scaffolding and access equipment
4.05.03	knowledge of operating procedures for scaffolding and access equipment
4.05.04	knowledge of scaffolding and access equipment safety
4.05.05	knowledge of manufacturers' recommended uses and limitations
4.05.06	ability to select scaffolding and access equipment for task
4.05.07	ability to identify damaged, worn, or otherwise unsafe scaffolding and access equipment
4.05.08	ability to position and erect scaffolding and access equipment
4.05.09	ability to secure ladders, staging, and scaffolding
4.05.10	ability to dismantle and store scaffolding and access equipment

Sub-task

4.06 Uses rigging, hoisting, and lifting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.06.01	knowledge of types and uses of hoisting and lifting equipment such as jacks, hoists and come alongs
4.06.02	knowledge of types and uses of rigging equipment such as belts, ropes, cables, and slings
4.06.03	knowledge of rigging, hoisting, and lifting equipment components

Supporting Knowledge & Abilities

4.06.04	knowledge of operating procedures and hand signals for hoisting and lifting equipment
4.06.05	knowledge of rigging procedures
4.06.06	knowledge of rigging, hoisting, and lifting equipment safety
4.06.07	knowledge of manufacturers' recommended use and limitations
4.06.08	ability to select and operate hoisting and lifting equipment for the task
4.06.09	ability to select rigging equipment for the task
4.06.10	ability to identify damaged, worn, or otherwise unsafe rigging, hoisting, and lifting equipment
4.06.11	ability to place hoisting and lifting equipment
4.06.12	ability to connect rigging equipment
4.06.13	ability to store rigging, hoisting, and lifting equipment

Sub-task

4.07 Uses personal protection equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.07.01	knowledge of types and uses of personal protection equipment
4.07.02	knowledge of components of personal protection equipment
4.07.03	knowledge of personal protection equipment safety
4.07.04	knowledge of manufacturers' recommended uses and limitations

Supporting Knowledge & Abilities

4.07.05	ability to select and use personal protection equipment for conditions encountered
4.07.06	ability to use harnesses, safety belts, and lines when working aloft
4.07.07	ability to identify damaged, worn, or otherwise unsafe personal protection equipment
4.07.08	ability to maintain personal protection equipment
4.07.09	ability to store personal protection equipment

Sub-task

4.08 Maintains tools and equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

4.08.01	knowledge of types of tools
4.08.02	knowledge of manufacturers' recommended maintenance procedures
4.08.03	ability to interpret manufacturers' manuals
4.08.04	ability to clean and lubricate hand tools and equipment
4.08.05	ability to clean and lubricate power tools
4.08.06	ability to perform minor repairs to power tools
4.08.07	ability to clean and lubricate powder-actuated tools
4.08.08	ability to maintain access equipment such as scaffolds, ladders, and lifts

BLOCK B

DISTRIBUTION AND SERVICES

Trends: *Deregulation of the utility industry has meant a greater number of service suppliers with different connection requirements and expectations. Use of computer networking has meant greater use of uninterruptible power supply (UPS) systems.*

Task 5 Installs service entrance.

Related Components: Mast, mast support, roof flange, meter base, weather head, conductors, main disconnect, panel, transformers, enclosures, overcurrent protection (grid rods and water main), compression joints, uninterruptible power supplies (UPS), batteries, inverters/chargers.

Tools and Equipment: Standard tools, safety equipment, access equipment, measuring equipment, portable generator, power drill, conduit benders (manual/hydraulic), fish tape, rope, tugger, torque wrenches.

Sub-task

5.01 Installs supply services. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.01.01 knowledge of types of supply service cables such as overhead and underground

5.01.02 knowledge of installation supply service materials such as insulators, mastheads, and supports

5.01.03 knowledge of tensioning requirements and practices

5.01.04 knowledge of excavation requirements for underground supplies

5.01.05 ability to size and select cables

5.01.06 ability to select equipment such as mobile access equipment and pullers

5.01.07 ability to tension cables

Supporting Knowledge & Abilities

5.01.08 ability to install conduit and fittings

5.01.09 ability to install and terminate conductors

Sub-task

5.02 Installs metering systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.02.01 knowledge of types of meters such as single, three-phase, analog, digital, and multi-user

5.02.02 knowledge of metering system installation procedures

5.02.03 knowledge of current and potential transformer applications

5.02.04 knowledge of enclosure requirements

5.02.05 knowledge of utility company requirements for placement and accessibility of meters

5.02.06 ability to co-ordinate installation of meters with utility company

5.02.07 ability to install enclosures

5.02.08 ability to install conduit and fittings

5.02.09 ability to install and terminate conductors

Sub-task

5.03 Installs overcurrent protection.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.03.01 knowledge of types of overcurrent protection such as fuses and breakers

Supporting Knowledge & Abilities

5.03.02	knowledge of sizes and ratings of overcurrent protection
5.03.03	knowledge of available fault current calculations
5.03.04	knowledge of fuse sequencing
5.03.05	ability to determine size and rating of overcurrent protection devices
5.03.06	ability to determine overcurrent protection type such as time delay and instant
5.03.07	ability to install enclosures
5.03.08	ability to install all types of overcurrent protection devices
5.03.09	ability to install and terminate conductors

Sub-task

5.04 Installs power distribution centre.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.04.01	knowledge of size and type of distribution centres such as three-phase, voltage, and amperage
5.04.02	knowledge of locations and clearances of power distribution centres
5.04.03	knowledge of power distribution centre installation procedures
5.04.04	knowledge of types of enclosures
5.04.05	ability to install enclosures
5.04.06	ability to install conduit and fittings
5.04.07	ability to install and terminate conductors

Sub-task

5.05 Installs temporary distribution.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.05.01	knowledge of work site requirements
5.05.02	knowledge of cables and protectors
5.05.03	knowledge of service entrances
5.05.04	knowledge of temporary distribution installation, access, and weather proofing procedures
5.05.05	ability to mount and connect temporary distributions
5.05.06	ability to test temporary distribution

Sub-task

5.06 Installs surge protection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

5.06.01	knowledge of ratings such as three-phase, voltage, and amperage
5.06.02	knowledge of surge protection system installation procedures
5.06.03	knowledge of customer requirements
5.06.04	knowledge of manufacturers' requirements
5.06.05	ability to calculate surge protector requirements
5.06.06	ability to connect surge protector systems

Sub-task

5.07 Installs power conditioning devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.07.01	knowledge of types and purposes of power conditioning devices
5.07.02	knowledge of power factors and power factor corrections
5.07.03	knowledge of power conditioning installation procedures
5.07.04	ability to mount power conditioning devices
5.07.05	ability to connect power conditioning devices
5.07.06	ability to test power conditioning devices

Sub-task

5.08 Installs uninterruptible power supply (UPS) systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.08.01	knowledge of types of UPS systems such as portable and fixed
5.08.02	knowledge of UPS installation procedures and techniques
5.08.03	knowledge of uses and requirements of UPS systems
5.08.04	knowledge of sizes of UPS systems such as kVA rating, time rating and voltages
5.08.05	ability to connect UPS systems
5.08.06	ability to test UPS systems

Sub-task

5.09 Performs start-up and shut-down procedures.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

5.09.01	knowledge of pre-start-up tests
5.09.02	knowledge of start-up procedures
5.09.03	knowledge of shut-down procedures
5.09.04	ability to monitor system performance

Task 6 Installs sub-panels, feeders, and transformers.

Related Components: Panels, conduit and fittings, conductors, transformers, breakers, fasteners, bus ducts.

Tools and Equipment: Standard tools, safety equipment, access equipment, test equipment, power drill, conduit benders (manual/hydraulic), fish tape, rope, tugger, torque wrenches.

Sub-task

6.01 Installs sub-panels.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

6.01.01	knowledge of size, types, and uses of sub-panels
6.01.02	knowledge of locations and clearances of sub-panels
6.01.03	knowledge of sub-panel installation procedures
6.01.04	knowledge of types of sub-panel enclosures
6.01.05	knowledge of conductor/conduit/cable sizes

Supporting Knowledge & Abilities

6.01.06	knowledge of environmental requirements such as wet or dry, and above or below ground
6.01.07	ability to install sub-panel enclosures
6.01.08	ability to install conduit and fittings

Sub-task

6.02 Installs feeders to sub-panels. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

6.02.01	knowledge of conductor/conduit/cable sizes
6.02.02	knowledge of environment such as wet or dry, and above or below ground
6.02.03	knowledge of parallel run requirements
6.02.04	knowledge of single conductor cable penetration and phasing requirements
6.02.05	knowledge of terminations
6.02.06	ability to install conductor components
6.02.07	ability to apply single cable penetration techniques
6.02.08	ability to connect conductors
6.02.09	ability to test conductors
6.02.10	ability to install bus ducts

Sub-task

6.03 Installs low voltage transformers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

6.03.01	knowledge of types and sizes of transformers such as single phase and three-phase
6.03.02	knowledge of transformer winding configurations
6.03.03	knowledge of multi-tap transformers
6.03.04	knowledge of purpose such as step-up or step-down or isolation
6.03.05	knowledge of mounting locations and conditions such as wall, floor, wet/dry
6.03.06	knowledge of transformer terminations
6.03.07	ability to mount transformers
6.03.08	ability to connect transformers
6.03.09	ability to configure multi-tap transformers
6.03.10	ability to test transformers

Task 7 Installs bonding, grounding, and cathodic protection systems.

Related Components: Conductors, bonding, bushings, electrodes, plates, ground fault equipment (breakers), split bolt connectors, lugs (mechanical/ compression/thermal weld), counter nuts.

Tools and Equipment: Standard tools, safety equipment, access equipment, measuring equipment, sledge hammer, crimping tools (manual/hydraulic), thermal welding tool.

Sub-task

7.01 Installs bonding systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

7.01.01	knowledge of types, purposes, uses, and requirements of bonding systems
7.01.02	knowledge of components of bonding systems
7.01.03	ability to bond equipment
7.01.04	ability to test bonds

Sub-task

7.02 Installs grounding grids. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

7.02.01	knowledge of requirements such as size of conductor and number of electrodes
7.02.02	knowledge of components such as grid rod and grid plate
7.02.03	knowledge of grounding grid installation procedures
7.02.04	ability to bond conductors to grids
7.02.05	ability to test grounding grids

Sub-task

7.03 Installs ground fault systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

7.03.01	knowledge of types, uses, and functions of ground fault systems
7.03.02	knowledge of purpose of ground fault systems

Supporting Knowledge & Abilities

7.03.03	knowledge of manufacturers' requirements and limitations
7.03.04	knowledge of location, clearance, and access requirements
7.03.05	knowledge of ground fault systems installation procedures
7.03.06	ability to mount ground fault systems
7.03.07	ability to connect ground fault systems
7.03.08	ability to test and adjust ground fault systems

Sub-task

7.04 Installs lightning arresters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no

7.04.01	knowledge of types of lightning protection systems
7.04.02	knowledge of purpose of lightning protection systems
7.04.03	knowledge of lightning protection installation procedures
7.04.04	ability to mount lightning protection equipment
7.04.05	ability to connect lightning protection equipment
7.04.06	ability to test lightning protection equipment

Task 8 Installs power generation systems.

Related Components: Generators, manual/auto transfer switches, conduit and fittings, conductors and cables, service equipment, solar panals (photo voltaic cells), wind generators.

Tools and Equipment: Standard tools, safety equipment, access equipment, measuring equipment, power drill.

Sub-task

8.01 Installs generators and transfer switches.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

8.01.01 knowledge of types of transfer switches such as manual and auto

8.01.02 knowledge of types of generators

8.01.03 knowledge of purpose and use of generators and transfer switches

8.01.04 knowledge of installation procedures and techniques of generators and transfer switches

8.01.05 knowledge of generator location requirements for access, ventilation, and clearances

8.01.06 knowledge of utility company requirements and regulations regarding alternative power systems

8.01.07 knowledge of operation and start-up of generators

8.01.08 ability to mount generators and transfer switches as per manufacturers' instructions

8.01.09 ability to connect generators and transfer switches

8.01.10 ability to program transfer switches

8.01.11 ability to test and adjust transfer switches and generators

Sub-task

8.02 Installs alternative power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no

8.02.01 knowledge of types of alternative power systems such as wind-generated, thermal, and solar

8.02.02 knowledge of alternative power systems' installation procedures

8.02.03 knowledge of operation of alternative power systems

8.02.04 knowledge of alternative power systems' location requirements for maximum efficiency

8.02.05 knowledge of utility company requirements and regulations regarding alternative power systems

8.02.06 ability to mount components

8.02.07 ability to connect alternative power systems

8.02.08 ability to test alternative power systems

Task 9 Installs high voltage systems.

Related Components: Vaults, high voltage insulators, high voltage conductors, high voltage transformers, high voltage cables, high voltage terminations, bus systems.

Tools and Equipment: Standard tools, safety equipment, access equipment, measuring equipment, power drill.

Sub-task

9.01 Installs high voltage transformers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

9.01.01 knowledge of types of high voltage transformers

9.01.02 knowledge of vault/site conformity

9.01.03 knowledge of operating principles of high voltage transformers

9.01.04 knowledge of clearance requirements of high voltage transformers

9.01.05 knowledge of high voltage transformer assembly installation procedures

9.01.06 knowledge of supporting and securing methods

9.01.07 knowledge of guarding requirements and methods

9.01.08 knowledge of rigging and hoisting procedures and techniques

9.01.09 ability to locate transformers

9.01.10 ability to mount and secure high voltage transformers

Sub-task

9.02 Installs high voltage cables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

9.02.01 knowledge of types of high voltage cables

9.02.02 knowledge of installation materials such as insulators and supports

Supporting Knowledge & Abilities

9.02.03	knowledge of marking requirements and practices
9.02.04	knowledge of tensioning requirements and practices
9.02.05	knowledge of excavation requirements
9.02.06	ability to size and select cables
9.02.07	ability to select equipment such as mobile access equipment and pullers
9.02.08	ability to tension cables

Sub-task

9.03 Terminates high voltage cables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

9.03.01	knowledge of high voltage termination principles and practices
9.03.02	knowledge of high voltage grounding and bonding practices
9.03.03	knowledge of high voltage connection techniques
9.03.04	knowledge of ground-fault installation requirements
9.03.05	ability to select high voltage termination devices
9.03.06	ability to connect system components

Sub-task

9.04 Tests high voltage systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

9.04.01	knowledge of high voltage test equipment
9.04.02	knowledge of high voltage safety equipment and practices
9.04.03	ability to select and operate test equipment
9.04.04	ability to interpret test data
9.04.05	ability to record and report test data
9.04.06	ability to confirm system operation

BLOCK C

BRANCH CIRCUIT WIRING

Trends: *Use of new types of wiring and insulation. Use of new products to meet new building systems and to increase speed of installation. A move toward greater use of "smart" heating/cooling controls.*

Task 10 Installs raceway systems and cables.

Related Components: Rigid conduits (PVC, metal), thin-walled conduits (EMT), cable shelves, gutters, cables (armoured, mineral insulated, non-metallic), flexible conduits (ENT).

Tools and Equipment: Standard tools, safety equipment, scaffolding and access equipment, measuring equipment, power tools and equipment, winches, communication devices, portable generators, powder-actuated tools, reel jacks.

Sub-task

10.01 Installs raceways. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

10.01.01	knowledge of types of raceways such as conduit (rigid and flexible, metal and non-metallic), electrical metallic and non-metallic tubing, underfloor raceways, cellular floors, surface raceways, wireways, cable trays busways, and auxiliary gutters
10.01.02	knowledge of types of raceway supports and fasteners such as straps and clamps
10.01.03	knowledge of proper spacing of raceway supports
10.01.04	knowledge of structural environment
10.01.05	ability to select raceways, supports, and fasteners for application
10.01.06	ability to bend conduit

Supporting Knowledge & Abilities

10.01.07 ability to install raceways and fittings

Sub-task

10.02 Creates openings.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

10.02.01 knowledge of structural materials such as concrete and drywall

10.02.02 knowledge of structural systems

10.02.03 knowledge of fireproofing requirements

10.02.04 knowledge of preliminary surveying techniques (X-rays)

10.02.05 ability to make openings

10.02.06 ability to seal openings

Sub-task

10.03 Installs seismic restraint systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no

10.03.01 knowledge of seismic restraint system installation procedures

10.03.02 knowledge of specifications of components such as cable size, type, and mounting hardware

10.03.03 knowledge of fabrication techniques

10.03.04 ability to mount and secure components such as cables and mounting hardware

10.03.05 ability to connect components such as cables and mounting hardware

Supporting Knowledge & Abilities

10.03.06 ability to fabricate mounting components

Sub-task

10.04 Installs underground wiring. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

10.04.01 knowledge of traffic and non-traffic areas

10.04.02 knowledge of underground wiring techniques such as open-hole and bored

10.04.03 knowledge of conductor protection and marking

10.04.04 knowledge of resilience and capacities of materials

10.04.05 knowledge of acceptable types of underground cables

10.04.06 knowledge of types of underground conduits such as rigid and PVC

10.04.07 ability to install underground conduit and cables

Sub-task

10.05 Installs boxes, cabinets, and fixtures. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

10.05.01 knowledge of types of boxes and cabinets such as pull boxes and junction boxes

10.05.02 knowledge of clearances and accessibility

10.05.03 knowledge of box, cabinet, and fixture sizing and installation procedures

10.05.04 knowledge of environmental requirements

Supporting Knowledge & Abilities

10.05.05 ability to secure and support boxes, cabinets, and fittings

10.05.06 ability to locate and punch knockouts

Sub-task

10.06 Pulls conductors in raceways. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

10.06.01 knowledge of size, number, and types of wires and insulation

10.06.02 knowledge of various lubricants

10.06.03 knowledge of fishing techniques and related hazards

10.06.04 ability to tag and pull wires

10.06.05 ability to calculate raceway capacity

10.06.06 ability to strip and splice wires

Task 11 Installs power and lighting systems.

Related Components: Devices (outlets, switches, dimmers, etc.), luminaires, photocells, timers, contactors.

Tools and Equipment: Standard tools, safety equipment, scaffolding and access equipment, measuring equipment, battery/rechargeable drills.

Sub-task

11.01 Installs luminaires. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

11.01.01 knowledge of types, functions, and applications of luminaires

Supporting Knowledge & Abilities

11.01.02	knowledge of the kinds of structures into which luminaires will be installed
11.01.03	knowledge of power and heat ratings
11.01.04	knowledge of clearance requirements
11.01.05	knowledge of weight considerations
11.01.06	ability to mount luminaires
11.01.07	ability to connect luminaires
11.01.08	ability to test luminaires

Sub-task

11.02 Installs devices, switches, and outlets.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

11.02.01	knowledge of types of devices
11.02.02	knowledge of installation procedures and device configuration
11.02.03	knowledge of the operation of devices
11.02.04	ability to determine device configuration and ratings
11.02.05	ability to connect devices
11.02.06	ability to test device operation

Sub-task

11.03 Installs lighting controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

11.03.01	knowledge of low voltage control panels and building operating systems

Supporting Knowledge & Abilities

11.03.02	knowledge of lighting control systems installation
11.03.03	knowledge of types and size of lighting controls such as timers, contactors, and photocells
11.03.04	knowledge of uses and requirements of lighting controls
11.03.05	knowledge of operation of lighting controls
11.03.06	ability to mount lighting controls
11.03.07	ability to connect lighting controls
11.03.08	ability to test lighting controls

Sub-task

11.04 Installs light posts.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

11.04.01	knowledge of light post installation procedures
11.04.02	knowledge of uses and requirements of light posts
11.04.03	knowledge of types and sizes of light posts and bases
11.04.04	ability to fabricate bases fitted with sleeves or conduits, anchoring bolts/studs and breakaways
11.04.05	ability to mount, fasten, and shim for level
11.04.06	ability to connect and ground light post
11.04.07	ability to adjust and aim luminaires, photocells, etc.

Task 12 Installs heating and cooling systems.

Related Components: Thermostats (duct averaging, area, changeover, programmable, etc.), contactors, relays, solenoid valves, water flow switches, actuators, airflow switches, overide switches, pilot lights, programmers, duct heaters, fasteners, baseboard heaters, under-floor heating systems, hot water heaters, heating panels, electrical space heaters.

Tools and Equipment: Standard tools, safety equipment, scaffolding and access equipment, measuring equipment, battery/rechargeable drill, percussion drill.

Sub-task

12.01 Installs electric heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

12.01.01	knowledge of types and sizes of electric heating systems such as heating panels, baseboard heaters, and heating cables
12.01.02	knowledge of electric heating installation procedures
12.01.03	knowledge of uses and requirements of electric heating
12.01.04	knowledge of operation of electric heating
12.01.05	ability to assess requirements of electric heating
12.01.06	ability to mount electric heating
12.01.07	ability to connect electric heating
12.01.08	ability to test electric heating

Sub-task

12.02 Connects cooling systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

12.02.01	knowledge of types of cooling systems
12.02.02	knowledge of uses and applications of cooling systems
12.02.03	knowledge of cooling system environmental conditions
12.02.04	ability to connect cooling systems
12.02.05	ability to test cooling systems

Sub-task

12.03 Installs heating/cooling control systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

12.03.01	knowledge of types of heating/cooling control systems
12.03.02	knowledge of uses and applications of control systems
12.03.03	knowledge of control system locations for clearance and access
12.03.04	knowledge of control system installation procedures and techniques
12.03.05	ability to mount control systems
12.03.06	ability to connect control systems
12.03.07	ability to calibrate and program control devices
12.03.08	ability to test control systems

Task 13 Installs emergency lighting systems.

Related Components: Exit fixtures, batteries, battery-operated lights, relays, emergency lighting, battery chargers.

Tools and Equipment: Standard tools, safety equipment, scaffolding and access equipment, measuring equipment, battery/rechargeable drill, percussion drill.

Sub-task

13.01 Installs exit lighting systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

13.01.01 knowledge of types and sizes of exit lights

13.01.02 knowledge of exit lighting installation procedures and techniques

13.01.03 knowledge of uses, requirements, and operation of exit lighting

13.01.04 ability to mount exit lighting

13.01.05 ability to connect exit lighting

13.01.06 ability to test exit lighting

Sub-task

13.02 Installs battery-operated lighting. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

13.02.01 knowledge of types and sizes of battery-operated lighting

13.02.02 knowledge of battery-operated lighting installation procedures and techniques

13.02.03 knowledge of uses and requirements of battery-operated lighting

13.02.04 knowledge of location requirements of battery-operated lighting

Supporting Knowledge & Abilities

13.02.05 knowledge of operation of battery-operated lighting

13.02.06 ability to mount battery-operated lighting

13.02.07 ability to connect battery-operated lighting

13.02.08 ability to test battery-operated lighting

BLOCK D

MOTOR AND CONTROL SYSTEMS

Trends: *A move toward the use of smaller, "smarter" programmable logic controllers (PLCs). Greater use of solid state digital controls.*

Task 14 Installs motor controls.

Related Components: AC/DC motors, generators, alternators, starters, overload relays, control devices, push button stations, probes and sensors, actuators, PLCs, variable speed drives, computers, software.

Tools and Equipment: Standard tools, safety equipment, access equipment, measuring equipment.

Sub-task

14.01 Installs starters.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

14.01.01 knowledge of types of starters such as magnetic, forward/reverse, and reduced voltage

Supporting Knowledge & Abilities

14.01.02	knowledge of starter operation and installation procedures
14.01.03	knowledge of sizing criteria
14.01.04	knowledge of types of enclosures such as dry, wet, or hazardous locations
14.01.05	knowledge of overload protection requirements
14.01.06	ability to install overload protection
14.01.07	ability to calculate feeder requirements for special conditions
14.01.08	ability to determine location of starters
14.01.09	ability to adjust starters
14.01.10	ability to size, select, and terminate starters
14.01.11	ability to test starters

Sub-task

14.02 Installs variable frequency drives (VFD).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

14.02.01	knowledge of types of drives
14.02.02	knowledge of types of enclosures such as wet, dry, or hazardous locations
14.02.03	knowledge of application requirements
14.02.04	knowledge of overload protection requirements
14.02.05	knowledge of harmonic disruption
14.02.06	ability to size drives
14.02.07	ability to terminate drives

Supporting Knowledge & Abilities

14.02.08	ability to calibrate and adjust drives
14.02.09	ability to determine location of drives
14.02.10	ability to calculate feeder requirements for special conditions such as shielding requirements and length of cable
14.02.11	ability to test drives

Sub-task

14.03 Installs overload protection.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

14.03.01	knowledge of motor sizes, types, and their characteristics
14.03.02	ability to calculate overload requirement
14.03.03	ability to size overload protection
14.03.04	ability to install overload protection
14.03.05	ability to test overload protection

Sub-task

14.04 Installs manual motor controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

14.04.01	knowledge of motor types and characteristics
14.04.02	knowledge of types of enclosures such as wet, humid, or hazardous locations
14.04.03	ability to calculate size of starter
14.04.04	ability to select overload protection
14.04.05	ability to terminate manual motor controls

Supporting Knowledge & Abilities

14.04.06 ability to adjust manual motor controls

14.04.07 ability to determine location of controls

Sub-task

14.05 Installs automatic motor controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

14.05.01 knowledge of types of motor control centres

14.05.02 knowledge of system requirements and applications

14.05.03 knowledge of control devices such as float and interlock switches

14.05.04 knowledge of multiple voltage systems

14.05.05 knowledge of types of relays, contactors, and control transformers

14.05.06 ability to calculate system requirements

14.05.07 ability to determine location of devices

14.05.08 ability to test system operation

14.05.09 ability to select and install relay devices

14.05.10 ability to adjust control devices

Sub-task

14.06 Installs PLCs.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no

14.06.01 knowledge of types of PLCs

14.06.02 knowledge of programming language

Supporting Knowledge & Abilities

14.06.03	knowledge of computer operating systems
14.06.04	knowledge of simulation testing
14.06.05	knowledge of interface requirements
14.06.06	ability to determine system requirements
14.06.07	ability to select PLCs for specific applications
14.06.08	ability to write basic PLC programs
14.06.09	ability to program PLCs
14.06.10	ability to plan and install interfaces
14.06.11	ability to test PLCs

Task 15 Installs motors.

Related Components: DC and AC motors, generators, pulleys and couplers, electric and dynamic breaking devices, shims, anti-vibration devices, alternators.

Tools and Equipment: Standard tools, safety equipment, measuring equipment, rigging and hoisting equipment, alignment tools.

Sub-task

15.01 Installs AC motors.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

15.01.01	knowledge of types of AC motors
15.01.02	knowledge of application such as load, system requirements, location, phase/voltage requirements, and starting requirements
15.01.03	ability to select and size motor
15.01.04	ability to mount and align motors
15.01.05	ability to lubricate motors

Supporting Knowledge & Abilities

15.01.06 ability to terminate motor connections

15.01.07 ability to test motors

15.01.08 ability to record test information

Sub-task

15.02 Installs DC motors.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no

15.02.01 knowledge of types of DC motors

15.02.02 knowledge of application such as load, system requirements, location, voltage requirements, and starting requirements

15.02.03 ability to size and select motor

15.02.04 ability to mount and align motors

15.02.05 ability to lubricate motors

15.02.06 ability to terminate motor connections

15.02.07 ability to test motors

15.02.08 ability to record test information

Sub-task

15.03 Installs motor overcurrent protection.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

15.03.01 knowledge of types of motors

15.03.02 knowledge of types of breakers and fuses such as time delay and high interrupting

15.03.03 knowledge of sizing criteria

Supporting Knowledge & Abilities

15.03.04	ability to calculate fuse or breaker size
15.03.05	ability to select fuses and breakers
15.03.06	ability to extract relevant information from motor name plate

BLOCK E

EXTRA LOW VOLTAGE SYSTEMS

Trends: *The deregulation of the cable/telecommunication industry means greater competition and confusion in ELV wiring. Instrumentation wiring is being used more often for energy management systems. Innovations in information technology have made an impact on wiring methods.*

Task 16 Installs signalling systems.

Related Components: Auto diallers, smoke detectors, heat detectors, fire alarms, fire alarm panels, pull stations, nurse call systems, intrusion alarms and related elements (motion detectors, sirens, bells, etc.).

Tools and Equipment: Standard tools, safety equipment, access equipment, measuring equipment, computers, software.

Sub-task

16.01 Installs fire alarm systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

16.01.01	knowledge of types of fire alarm systems such as addressable and zoned non-coded

Supporting Knowledge & Abilities

16.01.02	knowledge of components of fire alarm system such as heat detectors, smoke detectors, annunciators, pull stations, main and satellite panels
16.01.03	knowledge of types of circuitry such as Class A and Class B
16.01.04	knowledge of fire alarm installation procedures
16.01.05	knowledge of operating principles of fire alarms
16.01.06	ability to determine system requirements
16.01.07	ability to select components for chosen system
16.01.08	ability to mount system components
16.01.09	ability to connect system components
16.01.10	ability to interface with other building control systems
16.01.11	ability to operate self-test equipment
16.01.12	ability to confirm operation of system

Sub-task

16.02 Installs nurse call systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

16.02.01	knowledge of types of nurse call systems
16.02.02	knowledge of applications of nurse call systems
16.02.03	knowledge of components of nurse call systems
16.02.04	knowledge of operating principles of nurse call systems

Supporting Knowledge & Abilities

16.02.05 knowledge of installation procedures and techniques

16.02.06 ability to mount system components

16.02.07 ability to connect system components

16.02.08 ability to confirm operation of system

Sub-task

16.03 Installs security systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

16.03.01 knowledge of types of security systems such as silent/audible and addressable

16.03.02 knowledge of operating principles of security systems

16.03.03 knowledge of components of security systems such as sensors and panels

16.03.04 knowledge of application of security systems

16.03.05 knowledge of programming techniques

16.03.06 ability to determine system requirements

16.03.07 ability to select components

16.03.08 ability to locate and mount system components

16.03.09 ability to interface with other building systems

16.03.10 ability to program system components

16.03.11 ability to confirm operation of system

Task 17 Installs voice and data systems.

Related Components: Junction boxes, splitter boxes, relays, loudspeakers, call buttons, pull stations, annunciators, switches, push buttons, low voltage transformers, chimes, alarms, bells, amplifiers, microphones, sensors (motion, light, heat, smoke, pressure, magnetic, intruder, etc.), data cables, telephone cables, coaxial cables, instrumentation cables, cable terminations, grounding systems, lightning and surge arrestors, computers, servers.

Tools and Equipment: Standard tools, safety equipment, access equipment, data cable scanner, punch-down tools, attenuation tester, tone tester, testing handset, oscilloscopes, temperature probes, recording meters.

Sub-task

17.01 Installs telephone systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes

Supporting Knowledge & Abilities

17.01.01	knowledge of types of telephone systems
17.01.02	knowledge of manufacturers' certification requirements
17.01.03	knowledge of wiring methods and techniques
17.01.04	knowledge of system components such as patch panels and outlets
17.01.05	ability to determine system requirements
17.01.06	ability to select components
17.01.07	ability to mount system components
17.01.08	ability to interface with other building systems
17.01.09	ability to program equipment
17.01.10	ability to record test data and submit documentation
17.01.11	ability to confirm operation of system

Sub-task

17.02 Installs data network systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes

17.02.01 knowledge of types of data network systems

17.02.02 knowledge of manufacturers' certification requirements

17.02.03 knowledge of operating principles of data network cabling systems

17.02.04 knowledge of system components such as patch panels and outlets

17.02.05 knowledge of programming procedures

17.02.06 ability to determine system requirements

17.02.07 ability to select components

17.02.08 ability to mount system components

17.02.09 ability to connect system components

17.02.10 ability to interface with other building systems

17.02.11 ability to program equipment

17.02.12 ability to record test data and submit documentation

17.02.13 ability to confirm operation of system

Sub-task

17.03 Installs public address (PA) systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

17.03.01 knowledge of types of PA systems

Supporting Knowledge & Abilities

17.03.02	knowledge of operating principles of PA systems
17.03.03	knowledge of materials, wiring, and cabling
17.03.04	knowledge of wiring methods and techniques
17.03.05	knowledge of system components such as microphones and synthesizers
17.03.06	ability to determine system requirements
17.03.07	ability to select components
17.03.08	ability to mount system components
17.03.09	ability to connect system components
17.03.10	ability to confirm operation of system

Sub-task

17.04 Installs community antenna television (CATV) systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no

17.04.01	knowledge of operating principles of CATV systems
17.04.02	knowledge of materials, wiring and cabling
17.04.03	knowledge of wiring methods and techniques
17.04.04	knowledge of system ground requirements
17.04.05	knowledge of programming techniques
17.04.06	ability to select components
17.04.07	ability to mount system components
17.04.08	ability to connect system components
17.04.09	ability to program equipment
17.04.10	ability to confirm operation of system

Sub-task

17.05 Installs building automation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

17.05.01	knowledge of types of building automation systems such as energy management systems, integrated building systems, and "smart" buildings
17.05.02	knowledge of operating principles of automation systems
17.05.03	knowledge of specialized materials, wiring and cabling
17.05.04	knowledge of interrelationship between building system components such as lighting, heating, air conditioning, fire alarms, security, communications and elevators
17.05.05	knowledge of basic programming techniques
17.05.06	ability to determine system requirements
17.05.07	ability to select components
17.05.08	ability to mount system components
17.05.09	ability to connect system components
17.05.10	ability to program equipment
17.05.11	ability to calibrate control devices
17.05.12	ability to confirm operation of system

BLOCK F

UPGRADING, MAINTENANCE, AND REPAIR

Trends: *An increase in the upgrading of systems as technology expands. A move toward the use of self/automatic diagnosis.*

Task 18 Upgrades electrical systems.

Related Components: Rigid conduits (PVC, metal), thin-walled conduits (EMT), cable shelves, gutters, cables (armed, mineral-insulated, non-metallic), flexible conduits (ENT), devices (sockets/outlets, switches, thermostats, dimmers, etc.), luminaries, heating baseboards, photocells, heating and lighting timers and contactors.

Tools and Equipment: Standard tools, safety equipment, access equipment, measuring equipment, power tools.

Sub-task

18.01 Evaluates existing electrical systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

18.01.01 knowledge of current electrical systems

18.01.02 ability to investigate and evaluate existing conditions

18.01.03 ability to report existing conditions

Sub-task

18.02 Replaces outdated systems with new technology.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

18.02.01 knowledge of new products, systems, and designs

Supporting Knowledge & Abilities

18.02.02 ability to remove existing equipment

18.02.03 ability to select and install new products, systems, and designs

Task 19 Maintains electrical systems.

Related Components: Rigid conduits (PVC, metal), thin-walled conduits (EMT), cable shelves, gutters, cables (armed, mineral-insulated, non-metallic), flexible conduits (ENT), devices (sockets/outlets, switches, thermostats, dimmers, etc.), luminaries, heating baseboards, photocells, heating and lighting timers and contactors, motor control systems.

Tools and Equipment: Standard tools, safety equipment, testing equipment, access equipment, power tools.

Sub-task

19.01 Troubleshoots electrical systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

19.01.01 knowledge of electrical concepts

19.01.02 knowledge of troubleshooting techniques

19.01.03 knowledge of sequence of troubleshooting procedures

19.01.04 knowledge of the relationship between electrical and mechanical systems

19.01.05 knowledge of metering and testing equipment

19.01.06 knowledge of principles and sequence of system operations such as heating, cooling, air handling, data networking, and process control

Supporting Knowledge & Abilities

19.01.07 ability to gather and analyse relevant data such as communications with customer, maintenance logs, computer diagnostics, and schematic diagrams

19.01.08 ability to assess equipment

19.01.09 ability to use testing equipment and interpret test results

Sub-task

19.02 Replaces defective components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

19.02.01 knowledge of electrical systems and components such as ballast, coils, fuses, and motors

19.02.02 knowledge of removal procedures such as identification and marking of wires and lock-out procedures

19.02.03 knowledge of rigging and hoisting procedures and techniques

19.02.04 knowledge of reassembly techniques

19.02.05 ability to select and replace parts and components

19.02.06 ability to source replacement parts

19.02.07 ability to use rigging and hoisting equipment

19.02.08 ability to integrate new components into existing systems

Task 20 Performs preventative maintenance.

Related Components: Lubricants, cleaning solutions, maintenance schedules.

Tools and Equipment: Standard tools, safety equipment, test equipment, access equipment, heat detectors.

Sub-task

20.01 Tests system operation.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

20.01.01 knowledge of maintenance and operations manuals

20.01.02 knowledge of equipment operation and procedures

20.01.03 knowledge of operation of test equipment

20.01.04 ability to interpret maintenance and operation manual

20.01.05 ability to use test equipment

20.01.06 ability to maintain schedules

Sub-task

20.02 Cleans and lubricates systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

20.02.01 knowledge of types of lubricants and cleaners and their hazards

20.02.02 knowledge of operation of equipment

20.02.03 ability to select and apply lubricant and cleaners

20.02.04 ability to follow maintenance schedule

Sub-task

20.03 Establishes and maintains maintenance schedule.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes

20.03.01	knowledge of equipment being maintained
20.03.02	knowledge of customer's requirements
20.03.03	knowledge of manufacturers' requirements
20.03.04	knowledge of environmental conditions
20.03.05	ability to develop maintenance schedule applicable to equipment and environment

APPENDICES

TOOLS AND EQUIPMENT

Standard Tools

adjustable wrench
Allen key set
awl
cable cutters
centre punch
chalk line
cold chisel
combination square
combination wrench set
crimping pliers
crowbar
drill bits
files
fish tape
flashlight
fuse puller
hack saw
hammers
keyhole saw
knives
knockout cutter
measuring tape
multimeter
needle nose pliers
nut drivers
pipe benders
pipe cutters
pipe threader
pipe wrench
pliers
reamers
screwdrivers - Robertson 6, 8, 10;
Phillips 1, 2; flat blades (3 sizes)
side/diagonal cutters
slip joint pliers
socket set
strippers
tap set
tin snips
tool belt
tool bucket
torpedo level
wood chisel

Safety Equipment

coveralls (fire retardant)
ear plugs and muffs
eye wash facilities
face shields
fall arresters
fire blankets
fire extinguishers
first aid equipment
full body harness
fume and toxic gas detector
gloves
goggles
hard hat
insulated gloves
life line
lock-out kit
portable lighting
respirators
rope grabs
safety belt
safety glasses
safety vest
signage
steel toe boots
warning tapes

Scaffolding and Access Equipment

aluminium planks
boatswain's chair
boom lifts
ladders
ladder jacks, ladder jack scaffolds
mechanical scaffolds
rolling scaffolds
sawhorses
scissor-lift
stationary scaffolds
stepladders
swing stage

Power Tools and Equipment

band saws
battery/rechargeable drill
chop saw
circular saw
grinder
heat gun
hydraulic bender
hydraulic crimper
jig saw
percussion drill
power drill
power pipe benders
power pipe cutters
power pipe threaders
PVC bender
reciprocating saw
tugger
vacuum

Speciality Tools and Equipment

chain falls
come-along
communication devices
creepers and crawlers
extension cords
picks
portable generator
powder-actuated tools
reel jacks
rope
shackles
shovels
sledgehammer
slings
soldering apparatus
strain relief grips
wire rack

Measuring Equipment

ammeter
cable locator
circuit analyzer
frequency meter
ground meter, ground megohmmeter
hi-pot tester, dielectric tester
inductive voltage detector
insulation tester
jumpers
fault tester
LAN meter
light meter
megohmmeter
ohmmeter
oscilloscope
phase rotation meter
recording meter
tachometer
voltage tester
voltmeter

GLOSSARY

CAD	Computer-Assisted Design, Computer-Assisted Drafting
CATV	Community Antenna Television
CSA	Canadian Standard Association
ECUSR	Electrical Code Utility Safety Regulation (high voltage)
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrumentation Society of America
LAN	Local Area Network
MSDS	Material Safety Data Sheets
OHSA	Occupational Health and Safety Act
PLC	Programmable Logic Control Systems
ULC	Underwriters Laboratory Canada
UPS	Uninterruptible Power Supply Systems
WHMIS	Workplace Hazardous Material Information System

BLOCKS AND TASKS WEIGHTING

BLOCK A OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	13	20	5	19	5	15	5	5	25	10	10	10	20	12%

Task 1 Interprets occupational documentation.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	26	35	20	28	15	30	25	35	24	25	40	35	80	32%

Task 2 Organizes work.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	23	30	10	19	50	25	25	20	24	25	30	15	5	23%

Task 3 Communicates in the workplace.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	21	20	10	18	20	30	25	20	8	25	10	15	5	18%

Task 4 Uses and maintains tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	30	15	60	35	15	15	25	25	44	25	20	35	10	27%

BLOCK B DISTRIBUTION AND SERVICES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	24	20	35	22	25	25	25	20	26	25	25	20	20	24%

Task 5 Installs service entrance.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	22	25	40	25	30	30	25	25	38	30	25	25	30	28%

Task 6 Installs sub-panels, feeders, and transformers.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	24	35	40	28	30	30	25	25	12	25	25	20	30	27%

Task 7 Installs bonding, grounding, and cathodic protection systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	28	15	10	22	20	25	25	20	23	25	25	20	30	22%

Task 8 Installs power generation systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	14	20	10	13	10	5	15	15	12	10	15	20	5	13%

Task 9 Installs high voltage systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	12	5	0	12	10	10	10	15	15	10	10	15	5	10%

BLOCK C BRANCH CIRCUIT WIRING

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	20	25	30	23	25	25	25	25	19	25	25	20	20	24%

Task 10 Installs raceway systems and cables.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	25	45	40	28	30	40	30	35	42	40	40	35	40	36%

Task 11 Installs power and lighting systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	33	30	40	34	30	40	30	35	21	20	35	25	30	31%

Task 12 Installs heating and cooling systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	27	15	10	23	25	10	20	20	21	20	10	25	20	19%

Task 13 Installs emergency lighting systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	15	10	10	15	15	10	20	10	16	20	15	15	10	14%

BLOCK D MOTOR AND CONTROL SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	18	15	20	19	25	15	20	25	11	10	25	20	20	19%

Task 14 Installs motor controls.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	62	65	80	67	70	75	80	60	64	50	70	50	60	66%

Task 15 Installs motors.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	38	35	20	33	30	25	20	40	36	50	30	50	40	34%

BLOCK E EXTRA LOW VOLTAGE SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	10	10	5	9	10	12	10	15	10	15	10	10	10	10%

Task 16 Installs signalling systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	61	40	60	69	70	60	50	50	40	50	30	50	60	53%

Task 17 Installs voice and data systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	39	60	40	31	30	40	50	50	60	50	70	50	40	47%

BLOCK F UPGRADING, MAINTENANCE, AND REPAIR

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	15	10	5	8	10	8	15	10	9	15	5	20	10	11%

Task 18 Upgrades electrical systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	41	60	60	54	30	40	35	20	33	50	50	30	50	43%

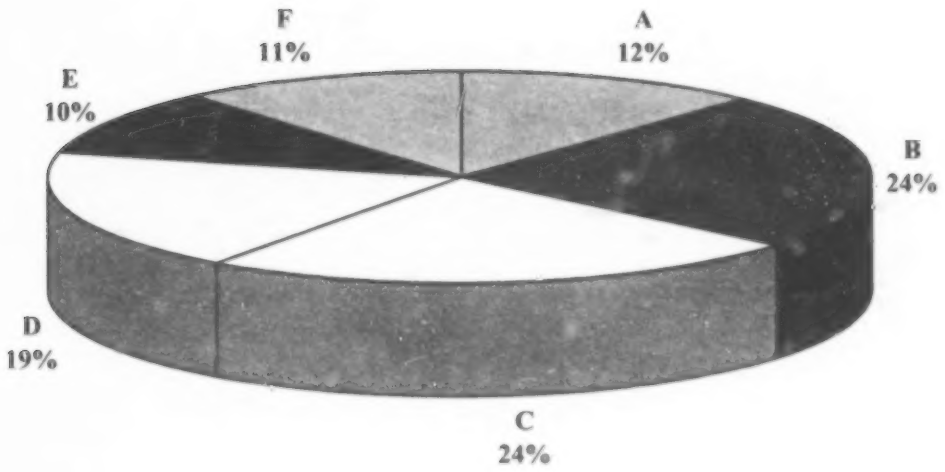
Task 19 Maintains electrical systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	32	25	30	31	40	40	35	60	34	25	25	40	40	35%

Task 20 Performs preventative maintenance.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	27	15	10	15	30	20	30	20	33	25	25	30	10	22%

PIE CHART*
Construction Electrician



TITLES OF BLOCKS

Block A	Occupational Skills	Block D	Motor and Control Systems
Block B	Distribution and Services	Block E	Extra Low Voltage Systems
Block C	Branch Circuit Wiring	Block F	Upgrading, Maintenance, and Repair

* The average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from one hundred up to one hundred and fifty multiple-choice questions on each examination.

BLOCKS	TASKS	SUB-TASKS								
A Occupational Skills	1. Interprets occupational documentation.	1.01 Interprets drawings and specifications.	1.02 Interprets codes and regulations.	1.03 Interprets material and equipment documentation.	1.04 Maintains work-related records.					
	2. Organizes work.	2.01 Prepares work site.	2.02 Performs lock-out and tagging procedures.	2.03 Estimates materials and supplies required for job.	2.04 Organizes materials and supplies.	2.05 Develops and maintains schedule.				
	3. Communicates in the workplace.	3.01 Communicates with other disciplines, co-workers, and clients.	3.02 Communicates with apprentices.							
	4. Uses and maintains tools and equipment.	4.01 Uses hand tools.	4.02 Uses power tools.	4.03 Uses powder-actuated tools.	4.04 Uses electrical measuring equipment.	4.05 Uses scaffolding and access equipment.	4.06 Uses rigging, hoisting, and lifting equipment.	4.07 Uses personal protection equipment.	4.08 Maintains tools and equipment.	
B Distribution and Services	5. Installs service entrance.	5.01 Installs supply services.	5.02 Installs metering systems.	5.03 Installs overcurrent protection.	5.04 Installs power distribution centre.	5.05 Installs temporary distribution.	5.06 Installs surge protection systems.	5.07 Installs power conditioning devices.	5.08 Installs uninterruptible power supply (UPS) systems.	5.09 Performs start-up and shut-down procedures.
	6. Installs sub-panels, feeders, and transformers.	6.01 Installs sub-panels.	6.02 Installs feeders to sub-panels.	6.03 Installs low voltage transformers.						
	7. Installs bonding, grounding, and cathodic protection systems.	7.01 Installs bonding systems.	7.02 Installs grounding grids.	7.03 Installs ground fault systems.	7.04 Installs lightning arresters.					
	8. Installs power generation systems.	8.01 Installs generators and transfer switches.	8.02 Installs alternative power systems.							
	9. Installs high voltage systems.	9.01 Installs high voltage transformers.	9.02 Installs high voltage cables.	9.03 Terminates high voltage cables.	9.04 Tests high voltage systems.					

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BLOCKS	TASKS	SUB-TASKS
C **Branch Circuit Wiring**	**10.** Installs raceway systems and cables.	10.01 Installs raceways. / 10.02 Creates openings. / 10.03 Installs seismic restraint systems. / 10.04 Installs underground wiring. / 10.05 Installs boxes, cabinets, and fixtures. / 10.06 Pulls conductors in raceways.
	11. Installs power and lighting systems.	11.01 Installs luminaires. / 11.02 Installs devices, switches, and outlets. / 11.03 Installs lighting controls. / 11.04 Installs light posts.
	12. Installs heating and cooling systems.	12.01 Installs electric heating systems. / 12.02 Connects cooling systems. / 12.03 Installs heating/cooling control systems.
	13. Installs emergency lighting systems.	13.01 Installs exit lighting systems. / 13.02 Installs battery-operated lighting.
D **Motor and Control Systems**	**14.** Installs motor controls.	14.01 Installs starters. / 14.02 Installs variable frequency drives (VFD). / 14.03 Installs overload protection. / 14.04 Installs manual motor controls. / 14.05 Installs automatic motor controls. / 14.06 Installs PLCs.
	15. Installs motors.	15.01 Installs AC motors. / 15.02 Installs DC motors. / 15.03 Installs motor overcurrent protection.
E **Extra Low Voltage Systems**	**16.** Installs signalling systems.	16.01 Installs fire alarm systems. / 16.02 Installs nurse call systems. / 16.03 Installs security systems.
	17. Installs voice and data systems.	17.01 Installs telephone systems. / 17.02 Installs data network systems. / 17.03 Installs public address (PA) systems. / 17.04 Installs community antenna television (CATV) systems. / 17.05 Installs building automation systems
F **Upgrading, Maintenance, and Repair**	**18.** Upgrades electrical systems.	18.01 Evaluates existing electrical systems. / 18.02 Replaces outdated systems with new technology.
	19. Maintains electrical systems.	19.01 Troubleshoots electrical systems. / 19.02 Replaces defective components.
	20. Performs preventative maintenance.	20.01 Tests system operation. / 20.02 Cleans and lubricates systems. / 20.03 Establishes and maintains maintenance schedule.